CLAIMS

What is claimed is:

1. A ballistic aerosol marking print head for depositing marking material, the print head comprising:

a gas channel coupled to a propellant source;

a reservoir in communication with the gas channel through an aperture;

a first gating electrode located proximate a first side of the aperture;

a second gating electrode located proximate a second side of the aperture;

a third gating electrode located in the gas channel;

a first voltage source having a first phase connected to the first gating electrode;

a second voltage source having a second phase in phase separation from the first phase, the second voltage source connected to the second gating electrode; and

a third voltage source having a third phase in phase separation from the second phase, the third voltage source connected to the third gating electrode;

wherein the first phase, second phase and third phase are sequenced so that marking material is metered from the reservoir into a propellant stream in the gas channel.

2. The ballistic aerosol marking print head of claim 1 wherein at least one of the first gating electrode, the second gating electrode or third gating electrode is connected to a corresponding one of the first voltage source, second voltage source or third voltage source so that the at least one of the first gating electrode, the second gating electrode or third gating electrode is selectably operable in one of a continuous mode or an on-demand mode.

CONTINUOUS & ON-DEMAND

2 CLAIMS

3. The ballistic aerosol marking print head of claim 1 wherein the third gating electrode is ~~connected to~~ CONTROLLED BY a data line for selectively operating the third gating electrode.

4. The ballistic aerosol marking print head of claim 1 wherein the aperture has a diameter less than 65 micrometers.

5. The ballistic aerosol marking print head of claim 1 wherein the gas channel comprises a nozzle and wherein the third gating electrode is opposing the aperture.

6. The ballistic aerosol marking print head of claim 1 wherein the third phase lags the second phase by approximately 90 degrees and the second phase lags the first phase by approximately 90 degrees.

7. The ballistic aerosol marking print head of claim 1 wherein the first, second and third voltage sources are

alternating current sources or phased direct current sources having the same frequency.

8. The ballistic aerosol marking print head of claim 1 further comprising:

a traveling wave grid having first, second and third electrodes located within the reservoir;

the first electrode connected to the first voltage source;

the second electrode connected to the second voltage source; and

the third electrode connected to the third voltage source.

9. The ballistic aerosol marking print head of claim 8 wherein the traveling wave grid further comprises a fourth electrode connected to a fourth voltage source having a fourth phase, the fourth phase lagging the third phase by approximately 90 degrees.

10. The ballistic aerosol marking print head of claim 1 wherein the distance from the second gating electrode to the third gating electrode is less than 100 micrometers.

11. The ballistic aerosol marking print head of claim 5 wherein the aperture has a centerline substantially perpendicular to the direction of flow of the propellant stream.

12. The ballistic aerosol marking print head of claim 5 wherein the marking material comprises low agglomeration toner having a particle size of 6 micrometers.

13. A toner gating apparatus for supplying toner through an aperture to a gas channel having a propellant stream, the toner gating apparatus comprising:

a traveling wave grid having electrodes;

a first gating electrode located proximate a first side of the aperture;

a second gating electrode located proximate a second side of the aperture;

a third gating electrode located in the gas channel;

a first voltage source having a first phase and being connected to both the first gating electrode and a first electrode of the travelling wave grid;

a second voltage source having a second phase and being connected to both the second gating electrode and a second electrode of the travelling wave grid; and

a third voltage source having a third phase and being connected to both the third gating electrode and a third electrode of the travelling wave grid.

14. The ballistic aerosol marking print head of claim 13 wherein at least one of the first gating electrode, the second gating electrode or third gating electrode is connected to a corresponding one of the first voltage

source, second voltage source or third voltage source so that the at least one of the first gating electrode, the second gating electrode or third gating electrode is selectably operable in one of a continuous mode or an on-demand mode.

CONTINUOUS & ON-DEMAND - 2 CLAIMS

15. The ballistic aerosol marking print head of claim 13 wherein the third gating electrode is connected to a data line for selectively operating the third gating electrode.

16. The toner gating apparatus of claim 13 further comprising a fourth electrode of the travelling wave grid connected to a fourth voltage source having a fourth phase, the fourth phase lagging the third phase by approximately 90 degrees.

17. The toner gating apparatus of claim 13 wherein the third phase lags the second phase by approximately 90 degrees and the second phase lags the first phase by approximately 90 degrees.

18. The toner gating apparatus of claim 16 wherein the third phase lags the second phase by approximately 90 degrees and the second phase lags the first phase by approximately 90 degrees.

19. The toner gating apparatus of claim 13 wherein the first, second and third voltage sources are alternating current sources or phased direct current sources having the same frequency.

20. The toner gating apparatus of claim 13 wherein the toner comprises low agglomeration toner having a particle size of 6 micrometers.

21. The toner gating apparatus of claim 13 wherein the distance from the second gating electrode to the first gating electrode is less than 100 micrometers and wherein the distance from the second gating electrode to the third gating electrode is less than 100 micrometers.

22. An image transfer apparatus having a toner gating apparatus according to claim 13.

23. A method of metering toner through an aperture into a propellant stream, the method comprising the steps of:

providing a traveling wave grid having electrodes;

locating a first gating electrode proximate a first side of the aperture;

locating a second gating electrode proximate a second side of the aperture;

locating a third gating electrode where the propellant stream is located between the second and third gating electrodes;

connecting a first voltage source having a first phase to both the first gating electrode and a first electrode of the travelling wave grid;

connecting a second voltage source having a second phase lagging the first phase to both the second gating

electrode and a second electrode of the travelling wave grid; and

connecting a third voltage source having a third phase lagging the second phase to both the third gating electrode and a third electrode of the travelling wave grid.

24. The method of metering toner through an aperture into a propellant stream of claim 23 further comprising the step of connecting a fourth voltage source having a fourth phase lagging the third phase by approximately 90 degrees to a fourth travelling wave electrode.